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DESIGN & MANUFACTURING OF ENGINEERING VISE FOR POWER SAW

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Abstract— Accurate and precise manufacturing of product is very cardinal factor in the industry, workshop & manufacturing section each process is analyzed accurately the manufacturing of engineering vise is easy & comfortable and having a fine contemplation on this regard & observing the anomalies occurred during the cutting forces of material using conventional vise & project idea got involved for the construction & devising the angular vise existing vice at no provision for holding the work piece in desired angle & thus sometimes thus the job would not head ahead to the accepted range. A fine study in design & manufacturing is carried out and acceptable attempt has been made for designing an vise which has provision for angular cutting, proper clamping & locating the job with ease & measuring the job parameter made easy**.**

Keywords— vise, defects, remedies, material

I. INTRODUCTION

A vise is a metal tool with movable jaws which are used to hold an object firmly in place while work is done on it, typically attached to a workbench. Vises have two parallel jaws, one fixed and other movable, threaded in and out by screw and lever. Work holding devices have crucial role in production engineering scenario, from the initiation to the termination of any manufacturing process the work holding devices play significant role. A minute bungle in holding the work piece may ultimately lead the entire process abortive. Thus in order to overcome the futility in the manufacturing, an appreciable tooling is needed. So generally when it comes to the precise holding of the work piece vises are held at the apex.

On accurately evaluating from engineering perception it reveals that vises should be able to hold the work piece and bolster stiffness of entire cutting operation. apart from secured and proper clamping, withstanding to the fluctuation and vibration and executing precise and accurate cutting of the work piece are some desired and worth factors for which the vises are held in such cardinal use.

II. PROBLEM STATEMENT

A. More time required to clamp the work piece:

Length of lead screw in the existing vise often fall short owing to which it use to take additional time to set up the vise for operation, this ultimately adds to the lead time of the process which was needed to overcome.

B. Improper clamping of the work piece:

The proper clamping of the workpiece between the jaws is primary function of vise. The lead screw impacts on the proper clamping and the clamping force required for holding the w workpiece. In the existing vise the lead screw had the direct attachment to the movable jaw and thus it lead to the moment on the movable jaw which hindered the proper clamping.

C. Cannot cut in angle i.e. it does not have swivel base:

Oftenly a demand aroused for the angular cutting of the work piece but the existing vise lacked the provision for the angular cutting. This sometimes proved ineffective to cater the workshop requirement.

D. Time consuming and the more wastage of material:

On abysmally excogitating on the subject it appear that there was an immense wastage of the workpiece material due to the improper clamping of the workpiece which certainly use to add to the cost of the raw material.

E. Rigidity of vise:

Due to the absence of the base plate, it hampered to the rigidity of vise. During the cutting operation the fluctuations and the vibrations cause the vise to deflect the jaws which lead the process seem cadaverous.

III. SCOPE & OBJECTIVES

A. SCOPE OF PROJECT*:*

The vise which had been used for the cutting till then had multiple flaws and demerits, which ultimately embarked the scope for the obviation of those flaws and thus design and manufacture a vise which has boot out those demerits. Apart from this, the new vise has been feathered with an angular cutting provision and linear scaling which perhaps accretes the scope for the cutting process in the different angles in the workshop whenever required in the future

B. OBJECTIVE OF PROJECT:

The basic objective of this project is to design an improved vise design for a power saw machine used in workshop. It is possible to determine whether the workshop gains a benefit after the improved vise is brought into function. The design of an improved vise should necessitate the reduction in cycle time by machining of components. The analysis of the existing vise will be helpful in determining the ways in which the improvements can be made. The improved vise can be designed.

IV. TROUBLE SHOOTING

Table-I

Sr. No.	DEFECTS	SYMPTONS	REASONES	RECTIFICATIONS
1.	More time required to clamp the work piece	Augmentation in cycle time	The length of lead screw falls short	Increase in the length of lead screw eliminated the problem
2.	Improper clamping of the workpiece	Deflection of jaw while holding the worlpoece	Direct attachment of lead screw to movable jaw which produce uneven movement	Introduction of intermediatory block between movable jaw and lead screw
3.	It is inconceivable to execute the angular cutting of material	Cannot cut in angle	The jaw plate is not imparted with angular movement and there is no provision for the angular scale	The angular scale has been provided and the jaw has been made movable in the specific direction for angular cutting

4.	Excessive wastage of material	Presence of scrap after the cutting operation	Improper clamping of the workpiece	Overall modification paved the way for the accomplishment of the proper clamping which it turns recoiled the wastage of workpiece material
5.	Poor rigidity of vise	Fluctuations, vibrations occurred during cutting operation	Absence of base plate	A base plate has been introduced in new designed vise so the base plate assimilate the fluctuations and the vibrations which ultimately upgraded the rigidity of the vise

V. NEW DESIGNED VISE SPECIFICATION

Table-II

Opening of jaw	100 mm
Width of jaw	190mm
Depth of jaw	128 mm
Weight (app.in kgs)	35 gs

A. MOVABLE JAW CALCULATION

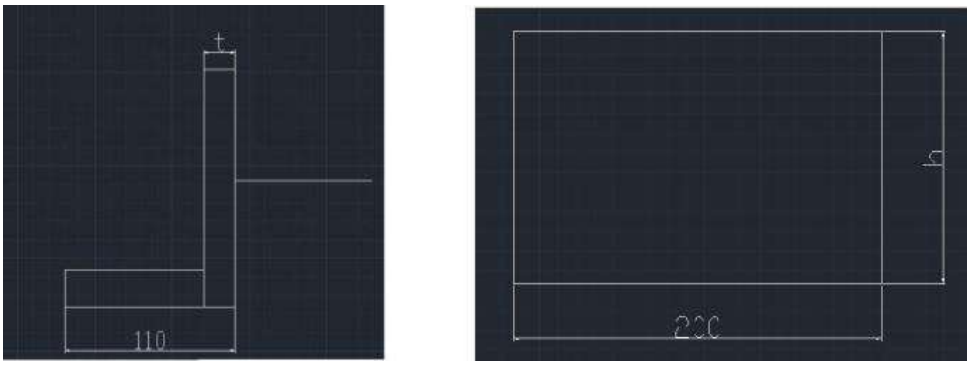

Fig.1 Movable Jaw

Plate:
Ultimate tensile strength = 410 N/mm^2
Yield strength = 250 N/mm^2
Ultimate shear strength = 246 N/mm^2
Width = 180 mm

Crushing Stress: σ = Force / Area

$$6.510 \times 10^{-3} = \frac{150}{(180 \times h)}$$

$$h = \frac{150}{(180 \times 6.510 \times 10\text{-}3}$$

h = 128 mm

Plate thickness calculation

As we know that

$$\tau = \frac{\text{Force}}{\text{Area}}$$

$$528 = \frac{1584}{128 \times t}$$

t = 25 mm

B. LOADS ON POWER SCREW CALCULATION

Given:

Manual force =15kg=150N
Length of screw= L= 350mm
Coefficient Of friction = μ= 0.15
Major diameter=do=24mm
Minor diameter =dc=19mm
Mean diameter =dam=21.5mm

$$\text{Tan } \alpha = \frac{\text{Lead}}{\pi dm}$$

$$= \frac{n \times p}{\pi \times 21.5}$$

$$\alpha = \tan^{-1} \frac{(1 \times 5)}{(31.14 \times 21.5)}$$

Friction angle= 8.5308º
Effort required moving the load against friction:
Pr = P Tan (ɵ + α)
= P Tan (4.235+8.5308)

= 0.2265 P N.

Torque required moving the load against thread friction

$$Tfr = pr \times \frac{dm}{2}$$

$$=0.2265 \times \frac{21.5}{2}$$

$$T_{fr} = 2.4843 \text{ P}$$

Torque exerted by operator = total torque required to move the load.

$F L = T_{fr}$

150 350 = 2.4348 P

P = 21562.345 N

Clamping force = P =21.562 KN

VI. MANUFACTURING OF VISE

A. VERTICAL JAW PLATE

Material: mild steel (IS 2062)

Size: 200 128 20 ± 0.5

Quantity: 2

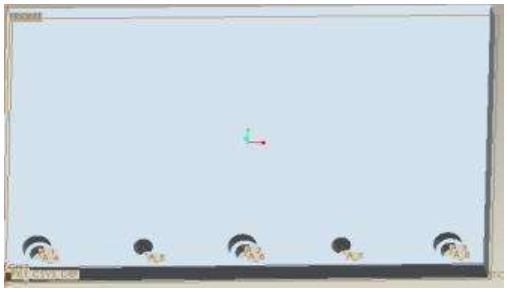

Fig.2 vertical jaw plate

B. HORIZONTAL JAW PLATE 1:

Material: Mild steel (IS 2062)

Size: 200 70 20 ± 0.5

Quantity: 1

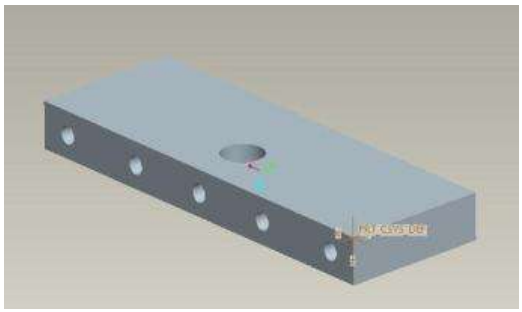

Fig.3 horizontal jaw plate

C. HORIZONTAL JAW PLATE 2:

Material: Mild steel (IS 2062)

Size: R100 20 ± 0.5

Quantity: 1

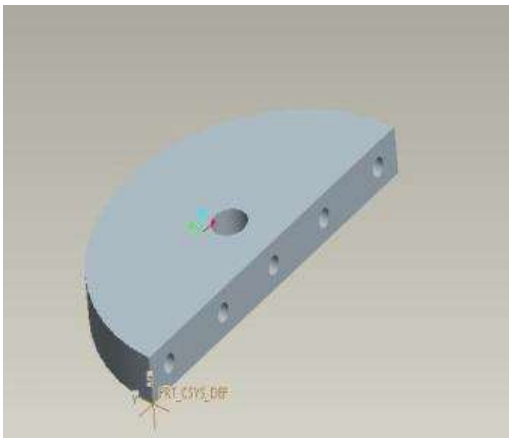

Fig.4 horizontal jaw plate

D. ANGLE BLOCK:

Material: Mild steel (IS 2062)
Size: 60 50 55 ± 0.5
Quantity: 1

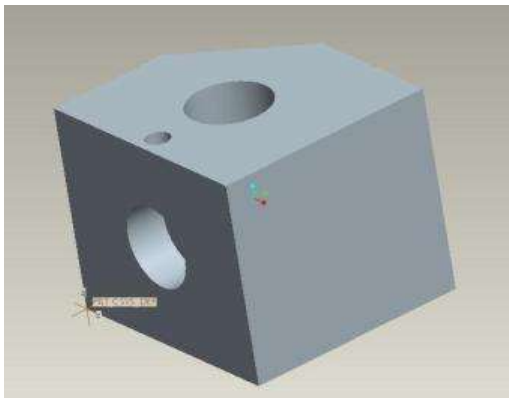

Fig.5 angle block

E. BASE PLATE:

Material: Mild steel (IS 2062)
Size: 510 250 25 ± 0.5
Quantity: 1

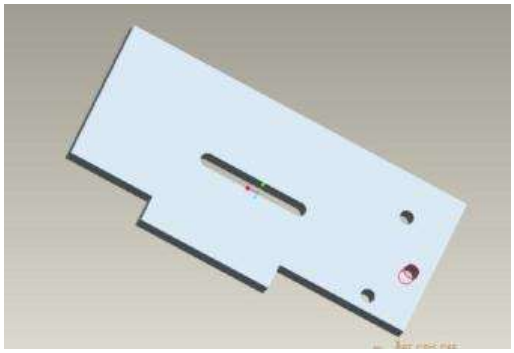

Fig.6 base plat

F. NEW DESIGNED VISE

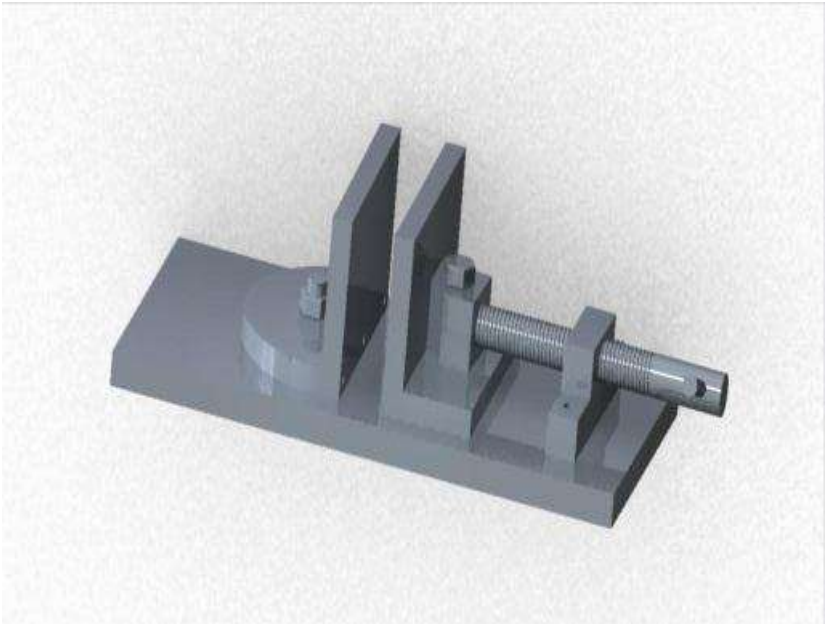

Fig.7 New designed vise

G. EXISTING VISE

Fig.8 Existing vise

H. NEW DESIGNED VISE

Fig.9 New designed vise

VII. CONCLUSIONS

- The project has encompassed the complete pragmatic applications of the production engineering concept.
- The anomalies and the flaws in the existing vise have been successfully detected and have been obviated.
- A new machine vise model with good rigid structure, suitable material and a model without

the flaws has been produced.

- Apart from the basic functionalities of the machine vise, it has been possible to achieve some outflank features like angular cutting, provision for the linear scale, reduction in time for the clamping of the work piece and reduction in the wastage of the work piece material.
- Overall a machine vise has been manufactured with the cost of Rs6500 which is less than the market price of the vise that ranges from Rs15000 to Rs30000 as per the requirement.

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